
Digital Technologies Supporting the Development of the Omnichannel Model in the Financial Sector

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Abstract:

Purpose: The main objective of the article was to evaluate the use of digital technologies in enterprises operating under an omnichannel model within the financial sector, with a particular focus on the methods of their implementation and their impact on improving customer experiences.

Design/Methodology/Approach: The research was divided into two stages. The first stage utilized literature related to the omnichannel model and digital technologies. In the second stage, information was gathered from the websites of selected companies and their publicly available financial and non-financial reports. Additionally, in-depth interviews were conducted with board members and IT department managers.

Findings: Digital technologies are crucial for the effective implementation and functioning of the omnichannel model in financial sector enterprises. Specifically, the analysis revealed that companies employ a range of innovative technologies, including artificial intelligence, Internet of Things (IoT), cloud computing, Big Data, blockchain, and VR/AR, which support both customer service processes and operational optimization. The implementation of these technologies ensures a consistent customer experience across various communication channels.

Practical implications: The research indicates that implementing modern technological solutions contributes to improving process efficiency, personalizing services, and increasing customer satisfaction. These implications are particularly significant for companies aiming to leverage the omnichannel model as a tool for building competitive advantage.

Originality/value: The study combines an analysis of innovative technologies such as AI, IoT, blockchain, Big Data, and cloud computing with their implementation in real business processes at companies like PZU SA and ING Bank Śląski.

Keywords: Digital technologies, omnichannel model, financial sector, customer experiences.

JEL codes: G21, M15, L86, O33.

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1. Introduction

The contemporary market increasingly relies on the emotions and experiences that a brand evokes among consumers. According to the study "Enduring Customer Friendship" conducted by PZU SA in 2021, a remarkable 90% of customers prefer companies with which they had positive experiences during their first purchase. This data indicates that a key challenge for businesses is implementing strategies and solutions that not only ensure high-quality products but also foster positive and lasting relationships with customers.

The omnichannel model is becoming a crucial solution that supports both operational efficiency and customer relationship building. The foundation of this model lies in the integration of various distribution channels, such as physical stores, e-commerce platforms, mobile applications, and social media, to create a cohesive and positive shopping experience. This allows customers to navigate freely between different channels (Colliers International, 2020).

In this context, new digital technologies like artificial intelligence, Big Data analytics, and the Internet of Things are invaluable supports. They enable precise recognition of customer needs, personalization of offerings, and optimization of purchasing paths across both offline and online channels. (McKinsey and Company, 2021). By skilfully utilizing these tools, companies can effectively design unique customer experiences, fostering long-term loyalty and strengthening their market position (Manser Payn, Peltier, and Barger, 2017).

Currently, designing positive customer experiences has become one of the key priorities. According to the report "Retailing 2020: Winning in a Polarized World" developed by PwC and Kantar Retail, the percentage of companies investing in designing customer experiences within the omnichannel model rose from 20% in 2012 to over 80% in 2020.

This demonstrates that managers are increasingly recognizing the importance of creating positive shopping experiences. The main objective of this article was to assess the use of digital technologies in enterprises operating under the omnichannel model within the financial sector, with a particular focus on their implementation methods and their impact on improving customer experiences.

The remainder of the article is structured as follows: Section two describes the research methodology, including the tools and techniques used for data analysis. Section three focuses on the essence and evolution of the omnichannel model. Section four presents characteristics of the financial sector, considering its operational specifics and the significance of new technologies in this area. Section five contains a comparative analysis of how digital technologies are utilized in two selected companies: PZU S.A. and ING Bank Śląski S.A., highlighting similarities and differences in their approaches to implementing the omnichannel model.

The article concludes with a summary and conclusions drawn from the conducted research.

2. The Research Material and Method

The article covers issues related to management and marketing concerning the operation of businesses in the omnichannel model. The following research question was posed: how do financial sector companies operating in the omnichannel model utilize new digital technologies to ensure positive shopping experiences for their customers?

Specific research objectives included:

1. Identifying key digital technologies used by companies operating in the omnichannel model within the financial sector and determining their role in optimizing customer service processes.
2. Presenting methods for implementing digital technologies in the business processes of financial sector companies, particularly in customer service, sales, and data management.
3. Assessing the impact of digital technologies on the operational efficiency of companies and their ability to build positive customer experiences.
4. Formulating recommendations for companies on effectively utilizing digital technologies in the omnichannel model to enhance competitiveness and customer satisfaction.

Achieving the specific objectives allowed for demonstrating how new technologies support the transformation of the financial sector towards integrated and customer-oriented operational models, as well as developing practical conclusions. The research was divided into two stages: the first utilized literature related to the omnichannel model and digital technologies. In the second stage, information was gathered from the websites of selected companies and their publicly available financial and non-financial reports. These documents provided essential information for conducting a comparative analysis.

An additional source of knowledge included in-depth interviews conducted with board members and IT department managers. These interviews enabled the acquisition of insights regarding practices for implementing digital innovations, organizational challenges, and companies' approaches to integrating the omnichannel model. Such triangulation of data sources allowed for obtaining a comprehensive picture of the studied issues.

3. Model Omnichannel in Subject Literature

The concept of omnichannel appears in various interpretations in the literature, and its understanding is not always uniform. Although this concept is not new, its

significance has evolved over the years. Initially, the *omnichannel* concept was an extension of the idea of Integrated Marketing Communication (IMC). IMC involved creating synergy among different marketing tools and promotional activities to communicate more effectively with customers (Belch and Belch, 2009). However, with the dynamic development of technology and increasing consumer expectations regarding shopping experiences, integrated marketing communication proved insufficient (Beacon a Celfocus blog/Frade, 2021).

Further research indicates that effective implementation of omnichannel communication required significant internal changes within companies. These changes included integrating technological systems and adopting an interdisciplinary approach to management that facilitated better coordination of activities among different departments (Hajduk, 2010; Colliers International, 2020).

Companies began to recognize the need to implement an *omnichannel* model that offers a more holistic approach to customer relationships, providing personalized communication tailored to individual needs (Manser Payne, Peltier, and Barger, 2017; McKinsey and Company, 2021). In the *omnichannel marketing communication model (OKM)*, both content and strategies focus entirely on the consumer, emphasizing the importance of customer-centricity in modern management (Gotwald, 2017).

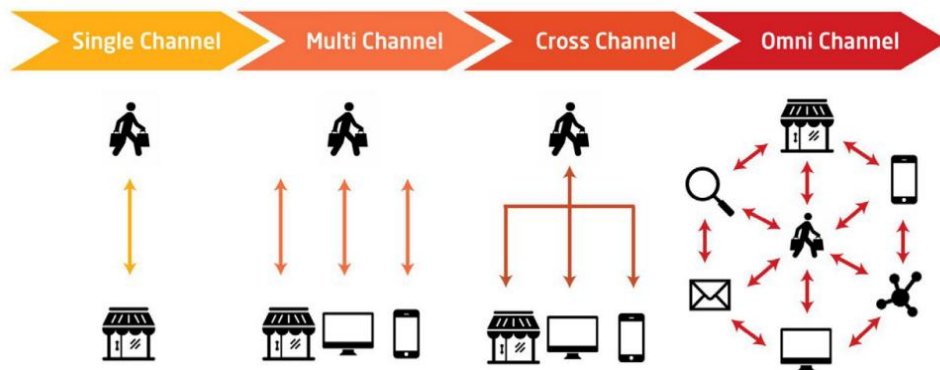
Thanks to technological advancements, the growing role of customer-centricity, and the adaptation of OKM, the main principles of the omnichannel model have started to be implemented not only in marketing communication but also in sales and business models (Verhoef, Kannan, and Inman, 2015). This led to the development of the *omnichannel* model, currently functioning as an advanced business model (Drobiasziewicz, 2018; Dyba, 2017). Effective management of sales and marketing channels plays a crucial role in this model. It relies on integrating marketing and sales channels while ensuring a continuous flow of data between them. Such integration enables companies to unify their sales and communication offerings, allowing them to deliver consistent experiences to customers regardless of the chosen channel (Smyk, 2019).

Consistency and a unified approach to channels—especially digital ones—are key elements of the Omnichannel model (Manser Payne *et al.*, 2017). These aspects differentiate it from other models such as Multi-channel or Cross-channel, which do not assume full integration of data and experiences across various channels (Figure 1).

The Omnichannel Model offers a holistic approach to managing customer relationships. Literature emphasizes that the modern approach to omnichannel focuses on creating value for the customer through the harmonious collaboration of all channels, positioning the model at the centre of contemporary enterprise management strategies. The goal of this model is to ensure that consumers receive

personalized, yet uniform and high-quality experiences, regardless of the chosen contact channel with the brand, whether online, via a mobile app, or in a physical store (Lipowski and Bondos, 2016).

Figure 1. Business model evolution from single to omnichannel



Source: CBInSights, (2021). *The Technology Driving the Omnichannel Retail Revolution*.

Implementing the Omnichannel Model in a business aims to provide customers with comfortable shopping experiences and seamless post-sale service. Conversely, it allows businesses to easily manage integrated systems and data while gathering extensive customer insights that can be utilized for more effective sales (Drobiazgiewicz, 2018). This enables companies to better tailor their offerings to customer needs, thereby increasing satisfaction and loyalty.

There are several key conditions that organizations must meet to operate within this model. According to Verhoef, Kannan, and Inman (2015), these include:

- Integrated sales and communication channels – enabling a consistent customer experience at every stage of interaction with the brand.
- Data collected from multiple sources and analysed in real-time – allowing for quick adjustments to actions based on customer needs and responses to changing market conditions.
- Understanding the essence of the Omnichannel Model, which means adopting a customer-centric approach – placing the customer at the centre of attention and aligning company actions with their expectations and needs.
- Processes designed with customer experiences in mind – ensuring that every point of contact with the company delivers positive experiences.
- Ability to analyse consumer behaviour across various sales channels – facilitating better alignment of offerings and communications with individual customer needs.

- Understanding the interdependencies arising from channel integration – knowledge about how different channels work together to create cohesive and effective experiences.
- Having more than one sales channel – ensuring product and service availability in various forms, enhancing convenience and accessibility for customers.

4. Characteristics of the Financial Sector

The financial sector has been at the forefront of industries distinguished by a high level of technological advancement for years. Its development is largely determined by changing consumer behaviours and rising expectations. Customers expect not only a wide availability of products and services but also a high level of data security and efficient, effective service (Śledziwska and Włoch, 2020). The adoption of an omnichannel model by financial enterprises seems a natural step, stemming from their technological maturity. Implementing this model primarily aims to enhance customer satisfaction by providing consistent and positive experiences across various communication and sales channels (Sobczyk, 2018).

In the Polish financial market, two key sectors can be distinguished: banking and insurance. The banking sector includes commercial banks, cooperative banks, and branches of credit institutions operating in the country. It is currently characterized by a high Herfindahl-Hirschman Index⁴ (HHI), indicating significant market competitiveness and considerable diversity among entities in the industry (Gemius 2021). Major market players include banks such as PKO BP, Pekao, Santander Bank Polska, ING Bank Śląski, and mBank.

The insurance sector can be divided into three main segments: life insurance, business insurance, and household insurance. The largest entities operating in the Polish insurance market are PZU SA, Ergo Hestia, Generali, Allianz, and Aviva,

⁴The HHI (Herfindahl-Hirschman Index) is a measure of market concentration used to assess the degree of monopolization or competitiveness in a given industry. It is calculated as the sum of the squares of the market shares of individual firms, expressed as percentages. The formula for calculating the HHI is as follows:

$$HHI = \sum_{i=1}^n (s_i)^2$$

where:

- s_i is the market share of the i -th firm expressed as a percentage (e.g., 0.2 for 20%)
- n is the number of firms in the market

Interpretation of the HHI indicator:

- Low HHI (close to 0): Indicates high competition and market fragmentation, with many small players
- High HHI (close to 10,000): Indicates high market concentration, suggesting the dominance of a few or a single firm, which may lead to market monopolization.

which dominate various market segments by offering a wide range of insurance products for both individual and corporate clients (Gemius 2021).

A representative of the insurance market in Poland is PZU SA, which holds the largest market share among insurance companies. The company acts as a parent organization for enterprises belonging to the PZU Capital Group. PZU SA began its operations in 1921 when the Polish Mutual Insurance Directorate was established and was privatized in 1998. The main shareholder of PZU SA is the State Treasury. The company operates 409 branches across the country, with 189 located in smaller towns. PZU collaborates with 9,700 exclusive agents, 3,200 multi-agencies, over 1,000 insurance brokers, and offers services through electronic distribution channels (Customer Experience Report 2021).

The primary and most popular products offered by PZU SA include insurances such as PZU Auto, PZU Dom, PZU Firma, PZU Wojązer, and PZU NNW. The company's net profit for 2021 amounted to PLN 906 million. The enterprise continuously implements innovative solutions that allow it to achieve further stages of its strategy for 2021-2024 aimed at developing an omnichannel model. Currently, PZU SA has seven distribution channels that are planned to be fully integrated by the end of the strategy implementation period. Additionally, for two years now, the company has been conducting its own Customer Experience research to better understand its clients' needs and tailor its offerings to their expectations (Customer Experience Report, 2021).

The banking sector is represented in this analysis by ING Bank Śląski, which annually receives awards for utilizing modern technologies and having the best mobile application. The bank's history dates back to 1988 when it began its operations as a state-owned enterprise. In 1991 it underwent privatization to become a joint-stock company and in 1996 became part of the ING Group after acquiring a majority of shares.

The bank operates 262 branches in Poland and has 4,202 ATMs used by over 4.3 million retail customers. Additionally, it offers an online service and the Moje ING mobile application that provides customers with convenient access to services. Another enhancement for users is the 61 ING Express points located in shopping centres that ensure quick access to banking services (Gemius, 2021). The bank declares its operation under an omnichannel model, reflected in its content management policy on websites. The use of e-point CMS⁵ software allows for proper communication at the right time and tailoring content to meet customer needs and expectations.

⁵**e-point CMS** is a system of content management (Content Management System, CMS) created by the company **e-point**, which enables content creation, editing and managing content on websites as well as other digital communication channels.

5. Comparative Analysis of the Use of Digital Technologies in Omnichannel Enterprises

The application of digital innovations in enterprises depends on various factors; however, operating within an omnichannel model requires meeting specific standards, which necessitate new digital technologies (Everest Group, Digital Services, 2018). Consequently, the study involved a review and analysis of the use of these technologies in companies recognized as technological leaders in this sector. The analysis was conducted in two stages: initially, it examined whether enterprises are implementing digital technologies, followed by an assessment of how these technologies are utilized in practice.

For detailed analysis, two companies from the financial sector were selected—one from the banking sector and the other from the insurance sector. The comparison focuses on PZU SA and ING Bank Śląski SA, which are leaders in advanced technologies (Table 1). Both companies regularly receive awards for their innovative technological implementations. PZU SA invests approximately 100 million PLN annually in the development of digital solutions (Customer Experience Report 2021).

Table 1. *The Use of Digital Technologies in PZU S.A. and ING Bank Śląski S.A.*

Technology	Enterprises from the financial sector	
	PZU SA	ING Bank Śląski SA
AI	• Data analysis • Marketing • Handling of transport insurance claims	• Data analysis • Marketing • Defining scale of risk • System security • Video-verification of identity
IoT	• Marketing • Assessment of driving style • Monitoring security	• Marketing • Cash machines • Profiling clients
Cloud	• Data analysis • Data storage	• Data analysis • Data storage • Central currency system
Big Data	• Data analysis • Marketing • Acturial	• Data analysis • Marketing • Risk assessment
Blockchain	• -	• Customer authentication
RFID	• PZU LAB Enterprise Safety Tools	–
VR	• Employee training	• Games, experiments and simulations
AR	–	• Games and simulations
QR	• Connection with mObywatel	•
Aplikacje	• Moje PZU	• Moje ING

Mobilne		
Robotizacja	● Robotization of processes	● SAIO ● Investo

Source: Own elaboration based on: Media.ing.pl. (2022). Press releases. Obtained from: <https://media.ing.pl/informacje-prasowe>, Cyfrowa.rp.pl. (2021). PZU liderem transformacji cyfrowej w ubezpieczeniach. Obtained from: <https://cyfrowa.rp.pl/cyfrowa/art19170461-pzu-liderem-transformacji-cyfrowej-w-ubezpieczeniach>.

Artificial intelligence (AI) has been utilized by PZU SA since 2018 in the handling of motor vehicle claims. Initially, this technology was employed to analyse images of vehicle damage and assess the extent of destruction. Since March 2022, it has been integrated with a dedicated mobile application, allowing PZU SA customers to independently report claims by submitting accident photos. AI algorithms analyse the submitted documents and prepare repair cost estimates, indicating which parts of the vehicle need repair, replacement, or repainting. This solution enables the claims processing to occur in just a few minutes, significantly streamlining the entire procedure.

ING Bank employs AI on a much broader scale. Advanced data analysis allows bank employees to accurately determine investment risks, greatly reducing the likelihood of costly mistakes. Another application of AI at ING is behavioural analysis of bank customers, enhancing the security of their accounts. With this technology, even if someone has a login and password, unauthorized individuals cannot access the account.

AI analyses how the account owner enters their login information, comparing it to a unique pattern for that user. If the login method deviates from the established pattern, access to the account is blocked. Additionally, the system monitors typing patterns and mouse movements. For keyboards, parameters such as typing speed, pressure intensity, and time taken between keystrokes are recorded. For mouse usage, movement curves and clicks are analysed. This solution provides a higher level of protection against intrusions, increasing customer security.

During the COVID-19 pandemic, ING introduced *video verification*, enabling remote opening of new bank accounts. With this technology, customers can complete the entire registration and identity verification process without visiting a bank branch. Video verification involves a video call with a bank consultant who checks identity documents and confirms customer data in real time. This solution has significantly simplified the account opening process, enhancing customer convenience and security while adapting banking services to a new reality where remote services have become standard.

Another innovative technology used by businesses is the Internet of Things (IoT). At PZU insurance company, this technology is applied in two novel ways. The first is the introduction of *PZU GO* in 2020—a device mounted on car windows that

connects with a dedicated mobile app on smartphones. The main goal of this device is to increase traveller safety. The PZU GO system automatically takes actions that may help save lives if it detects significant overloads that could indicate an accident. Additionally, it records driver behaviour styles, allowing for an analysis of driving habits that may influence insurance offerings and reward safe driving.

The second solution introduced by PZU utilizes IoT technology combined with RFID during audits in large buildings, manufacturing plants, and other high-risk insured properties. This system, named *PZU LAB Enterprise Safety Tools*, includes RFID readers that work with smart sensors installed in audited facilities. By analysing collected data, PZU can assess whether manufacturing processes, logistics, machines, and security systems operate correctly and ensure adequate safety levels. This solution allows for effective risk monitoring and quicker identification of potential threats in real time.

ING Bank also uses IoT technology for customer profiling by collecting data from various electronic devices to accurately determine user preferences and needs regarding offered services. Through analysing large datasets, the bank can better tailor its offerings to individual customer expectations. An interesting aspect of this technology is ATMs that are integral to the IoT system; these ATMs not only facilitate transactions but also gather data about customers and conducted operations. This information allows the bank to further streamline processes and personalize services based on actual user needs and behaviours.

Both companies utilize cloud solutions but to different extents. At PZU SA, cloud resources are primarily viewed as an extension of their own network infrastructure aimed at increasing available storage capacity. Conversely, ING Bank Silesia implemented a new core banking system based on cloud solutions in December 2021. This new system, known as *Vault*, is a crucial element in the bank's digital transformation process. Its implementation aims to streamline product introductions and enable full personalization of customer offerings, ultimately leading to increased customer satisfaction.

Blockchain technology is used by ING Bank Silesia for authenticating customers during letter of credit transactions—an additional safeguard used in business transactions. A letter of credit involves settling transactions between buyers and sellers based on documents verified by the bank, minimizing the risk of purchasing goods that do not meet contract conditions. The use of blockchain technology in this process eliminates paper documents, accelerates transaction execution, and facilitates smoother communication between parties involved. As a result, the entire process becomes safer, more transparent, and less prone to errors or frauds—thereby increasing trust between transaction parties (Gemius, 2021).

Virtual Reality (VR) technology at PZU SA is used internally for training employees and insurance agents. By utilizing VR goggles, training participants can immerse

themselves in simulated insurance claim scenarios, taking on the role of a claims adjuster. This approach enables them to practically address the problem of identifying the cause of damage. Such a method allows for realistic training in a safe, controlled environment.

At ING Bank, Augmented Reality (AR) and Virtual Reality (VR) technologies are employed to design games and simulations aimed at customers. These initiatives are both marketing and educational, assisting clients in better understanding banking products and services through interactive experiences that engage them in a more appealing and accessible way (Customer Experience Report 2021).

PZU SA was the first in Poland to allow its clients to verify their data using the government application *mObywatel*. The authentication process utilizes QR code technology. To confirm their data, clients need only to scan a code generated in *mObywatel* using the *mojePZU* app. Once scanned, the client's data is automatically transmitted to the insurance company, significantly simplifying and speeding up the identity verification process. This innovative solution enhances client convenience while ensuring a high level of security and compliance with legal regulations (Customer Experience Report 2021).

Both companies, PZU SA and ING Bank Śląski, have developed mobile applications for their clients—*mojePZU* and *Moje ING*—which allow access to personal accounts and products offered by the companies. These applications are designed with user convenience in mind, providing easy access to services and information. Due to the storage of sensitive data within them, both *mojePZU* and *Moje ING* offer advanced security mechanisms that protect users' privacy and security by employing the latest encryption and authentication technologies.

Advanced enhancements related to business process automation are taking place at both PZU SA and ING Bank. The use of robots at PZU was previously described in the context of artificial intelligence applications. In contrast, automation at ING takes various forms. One example is the implementation of the *Investo* robot, which advises clients on the best ways to invest their money. The robot generates recommendations for purchasing a personalized investment fund portfolio tailored to the client's needs. Once the user accepts the proposal, *Investo* monitors the portfolio, ensuring that the investment risk remains at a level specified by the client at the beginning of the investment.

Another way ING utilizes automation is through the launch of the *SAIO* platform in mid-2021, which is a product of the bank. This software offers tools for optimizing and automating business processes to other companies across various sectors. Through the *SAIO* platform, ING provides comprehensive robotic services, including business process reviews, automation training, and implementation of developed tools—robots. Thanks to these solutions, companies can gain access to

advanced technologies that streamline their operations, reduce costs, and increase operational efficiency.

PZU SA has not yet implemented blockchain technology in its systems. On the other hand, ING Bank Śląski does not utilize radio frequency identification (RFID) technology or QR codes. However, there is a possibility that changes in this area will occur soon as the institution plans to introduce such services, with work on their implementation already underway.

6. Summary and Conclusions

Digital technologies are crucial for the effective implementation and functioning of the omnichannel model in financial sector enterprises. In particular, the analysis has shown that companies such as PZU SA and ING Bank Silesia utilize a range of innovative technologies, including artificial intelligence, Internet of Things (IoT), cloud computing, Big Data, blockchain, and VR/AR, which support both customer service processes and the optimization of operational activities.

The implementation of these technologies allows for a consistent customer experience across various communication channels. Furthermore, digital technologies enable faster and more secure transaction processing as well as the personalization of offerings, which increases the competitiveness of companies in the market.

The financial industry is characterized by a different approach to implementing new digital technologies. A particular emphasis is placed on data security, which means that every new solution must undergo thorough verification before implementation. The example of PZU SA illustrates how digital technologies are used not only for daily, basic operational activities of the company but also to enhance customer security, which is a significant element in building consumer trust and loyalty.

The analysis of technology implementation at PZU and ING has shown that both companies adopt different approaches to system integration and data utilization, with an emphasis on security and compliance with regulations. The conclusions from the article highlight the importance of full integration of sales and communication channels, as well as the need for continuous monitoring and adjustment of technologies to meet changing customer needs and expectations.

These studies are not without limitations. The research was conducted based on examples from two companies operating in Poland (PZU SA and ING Bank Silesia), which limits the ability to generalize results to other markets or financial sector enterprises operating in different countries. The study focuses on selected technologies and their impact on customer experiences and operational efficiency; however, it does not examine other important aspects such as implementation costs, organizational difficulties, or impacts on organizational culture.

These limitations indicate the need for further research that could consider a broader context and additional factors influencing the success of digital technology implementation in an omnichannel model in the financial sector.

References:

- Beacon a Celfocus blog/Frade, E. 2021. What is Optichannel? – Part 1. Pobrano z: <https://www.celfocus.com/beacon/what-is-optichannel>.
- Bernaś, M. 2021. Big Data dzisiaj! Pobrano z: <https://ibigworld.ath.edu.pl/index.php/2021/03/22/big-data-dzisiaj/>.
- CBInSights. 2021. The Technology Driving the Omnichannel Retail Revolution. CBInSights.
- Colliers International. 2020. Omnichannel – z ewolucji w rewolucję. Spojrzenie na pandemię – badanie ankietowe. Colliers International.
- Drobiazgiewicz, J. 2018. Omnichannel jako nowoczesny model sprzedaży wielokanałowej. *Ekonomiczne Problemy Usług*, 131, s. 47-54.
- Everest Group., Digital Services. 2018. Annual Report 2018: Future Operating Model to Scale Digital. Everest Group., Digital Services.
- Gemius. 2021. E-commerce w Polsce 2021. Gemius.
- Gotwald, B. 2017. Komunikacja marketingowa w realiach omnichannel – ujęcie modelowe. *Marketing i Zarządzanie*, 1(47), s. 261-271.
- Grzega, U., Kieźel, E. 2017. Trendy w zachowaniach konsumentów. In: M. Bartosik-Purgat, (red.). *Zachowania konsumentów. Globalizacja, nowe technologie, aktualne trendy, otoczenie społeczno-kulturowe* (s. 31-36). Warszawa: PWN.
- Hajduk, G. 2010. Poziomy płaszczyzny i rodzaje integracji komunikacji marketingowej. *Zeszyty Naukowe/Uniwersytet Ekonomiczny w Poznaniu*, 1689-7374, s. 20-29.
- International Data Corporation. 2019. 2019 Annual Report. IDC.
- Lipowski, M., Bondos, I. 2016. Omnikanalowość – Czy rynek zweryfikuje koncepcję teoretyczną? *Organizacja i Zarządzanie: kwartalnik naukowy*, 1, s. 71-82.
- Łobejko, S. 2018. Strategie cyfryzacji przedsiębiorstw. In: R. Knosala (red.). *Innowacje w Zarządzaniu i inżynierii produkcji* (s. 608-614). Opole: Oficyna Wydawnicza Polskiego Towarzystwa Zarządzania Produkcją.
- Manser Payne, L., Peltier, J., Barger, V. 2017. Omni-channel marketing, integrated marketing communications and consumer engagement: A research agenda. *Journal of Research in Interactive Marketing* 11, s.185-197.
- McKinsey and Company. 2021. Nowa cyfrowa przewaga: nowe podejście do strategii w erze post pandemicznej. McKinsey and Company.
- Mróz-Gorgoń, B., Szymański, G. 2018. Wpływ efektu ROPO w branży odzieżowej. *Przegląd Ekonomii i Biznesu*, 4, s. 24-35.
- oracle.com. 2017. Co to jest IoT? Pobrano z: <https://www.oracle.com/pl/internet-of-things/what-is-iot/>.
- oracle.com. 2022. Czym jest sztuczna inteligencja (AI)? Pobrano z: <https://www.oracle.com/pl/artificial-intelligence/what-is-ai/>.
- Pizło, W., Filipowicz, A. 2019. Konsekwencje rozwoju sztucznej inteligencji. *Problems of Economics and Law*, 3, s. 1-14.
- pl.economy-pedia.com. 2021. Technologia. Pobrane z: <https://pl.economy-pedia.com/11040818-technology>.
- Pricewaterhouse Coopers, Kantar Retail. 2020. Retailing 2020: Winning in a polarized world. PwC/Kantar Retail.

- Powszechny Zakład Ubezpieczeń Spółka Akcyjna. 2021. Trwała przyjaźń z klientem. Raport Customer Experience 2021. PZU SA.
- Rot, A., Zygała, R. 2018. Technologia blockchain jako rewolucja w transakcjach cyfrowych. Aspekty technologiczne i potencjalne zastosowania. Informatyka Ekonomiczna. Prace Naukowe Uniwersytetu Ekonomicznego we Wrocławiu, 4(50), s. 122-134.
- Sachpazidu, K. 2021. Transfer technologii. Transfer pionowy i transfer poziomy w działalności przedsiębiorstw. Warszawa: CeDeWu.
- Smyk, S. 2019. Wielokanałowość sprzedaży jako wyzwanie dla menedżerów logistyki dystrybucji. Gospodarka Materiałowa i Logistyka, 10, s. 11-18.
- Sobczyk, G. 2018. Zachowania konsumentów wobec nowych trendów konsumpcji - wyniki badań. Annales Universitatis Mariae Curie-Skłodowska. Sectio H, 52(1), s. 171-180.
- Śledziewska, K., Włoch, R. 2020. Gospodarka cyfrowa. Jak nowe technologie zmieniają świat. Warszawa: Wydawnictwo Uniwersytetu Warszawskiego.
- Tylżanowski, R. 2017. Bariery rozwoju w polskim systemie transferu technologii i komercjalizacji wiedzy. Zeszyty Naukowe Uniwersytetu Szczecińskiego. Studia i Prace WNEiZ, 47(1), s. 297-306.
- Verhoef, P., Kannan, P.K., Inman, J. 2015. From Multi-Channel Retailing to Omni-Channel Retailing. Journal of Retailing, 91(2), s. 8-16. DOI: 10.1016/j.jretai.2015.02.005.
- Wyrzykowska, B. 2020. Modele biznesowe współczesnych organizacji Studium teoretyczno-empiryczne. Warszawa: Wydawnictwo SGGW.
- YourCX. 2021. Raport Omnichannel 2021. YourCX.